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VALVULAR HEART DISEASE

MEASUREMENT OF CARDIAC FUNCTION USING PRESSURE-VOLUME CONDUCTANCE CATHETER TECHNIQUE IN A NEW RAT MODEL OF CHRONIC MITRAL REGURGITATION

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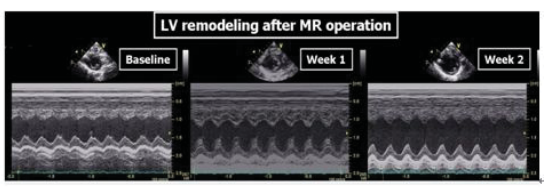
Objectives: The aims of this study were to develop a new animal model of chronic mitral regurgitation and to measure cardiac function using pressure-volume conductance catheter technique in a new animal model of chronic mitral regurgitation (MR) in rats.

Method: MR was created by following method. Left thoracotomy was performed in 36 Sprague-Dawley (SD) rats. A fine needle (0.45mm diameter) was introduced through LV apex under the guidance of transesophageal echocardiography and made a hole on mitral leaflet. MR was considered significant if a regurgitant jet area occupied more than 45% of the left atrium. Serial echocardiographic exams and swimming test for evaluating exercise capacity were performed at 2-week intervals. Hemodynamic analysis was done at 14 weeks after MR formation.

Results: Echocardiographic parameters and exercise capacity were significantly different between MR group (n;18) and control group (n;18). Left ventricular dilatation and exercise intolerance were developed in MR group (LV end-systolic dimension at 14 weeks, 4.3± 0.2 vs 5.5± 0.4 mm for control vs. MR, P < 0.01; LV end-diastolic dimension, 7.6±0.1 vs 8.6±0.2; swimming duration, 465 vs 427 seconds, p < 0.001). In hemodynamic analysis, LV end systolic volume and the EDPVR slope were greater in MR group than in control group.

Conclusion: We successfully set up a rat model of significant MR and evaluate cardiac function using pressure-volume conductance catheter.



Hemodynamic parameters measured by the Pressure-Volume conductance catheter system

	Control	MR	P value
HR, beats/min	333±42	346±71	0.93
ESV, μl	105.0±38.2$_a$	218.0±64.3$_b$	**< 0.01**
ESV/Bwt, μl/g	0.19±0.08$_a$	0.38±0.09$_b$	**< 0.01**
EDV, μl	327.8±77.0$_a$	436.0±22.6$_b$	**< 0.01**
EDV/Bwt, μl/g	0.57±0.18$_a$	0.77±0.04$_{a,b}$	**< 0.01**
EF, %	69.5±4.0$_a$	61.7±3.5$_b$	**< 0.01**
SV, μl	232.3±38.1	298.0±107.4	0.47
SV/Bwt, μl/g	0.40±0.09	0.52±0.15	0.21
LV ESP, mmHg	92.3±6.5$_a$	96.9±6.3$_a$	**< 0.01**
LV EDP, mmHg	33.5±2.0	31.6±3.3	0.53
Cardiac output, ml/min	78.6±6.3	96.5±1.4	0.37
+dP/dt, mmHg/s	5124.0±1466.9	4847.3±1304.7	0.69
-dP/dt, mmHg/s	-3781.3±722.0	-3942.9±631.9	0.07
τ (Weiss), ms	18.8±8.5	15.9±3.8	0.65
ESPVR, mmHg/dl	36.1±13.3	33.1±19.9	0.76
EDPVR, mmHg/dl	0.4±0.4$_a$	1.4±0.5$_b$	**< 0.01**